

Our Reference: UMJ-116-E (UM-2172 p3)

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Title: SELECTIVE SORBENTS FOR PURIFICATION OF  
HYDROCARBONS

DECLARATION PURSUANT TO 37 C.F.R. § 1.132

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

I, Arturo J. Hernández-Maldonado, hereby declare the following:

1. I am a co-inventor of the above-identified application.
2. I am a citizen of the United States residing in Mayagüez, Puerto Rico.
3. I received a Bachelor of Science in Chemical Engineering from the University of Puerto Rico at Mayaguez in 1995.
4. I received a Master of Science in Chemical Engineering from the University of Puerto Rico at Mayaguez in 1997.
5. I received a Ph.D. in Chemical Engineering from the University of Michigan, Ann Arbor, Michigan in 2004.
6. I was a Chemical Engineering Instructor in the Department of Chemical Engineering at the University of Puerto Rico at Mayaguez from 1997 – 2000. In 2004, I joined the University of Puerto Rico at Mayaguez as an Assistant Professor in the Department of Chemical Engineering.
7. As a Ph.D. student at the University of Michigan, and as a professor at the University of Puerto Rico at Mayaguez, I have engaged in research in the fields of Nanostructured

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Materials Synthesis, EPR (Electron Paramagnetic Resonance), XRD (X-ray Diffraction), Neutron Diffraction, and SEM-EDAX (Scanning Electron Microscopy), Molecular Dynamics, Gas and Liquid Phase Adsorption Processes, Separation Processes (PSA, etc.), and Molecular Orbital Calculations.

8. I have published fourteen (14) peer-reviewed journal articles in the field of adsorption and related areas.

9. From 2001 – 2004, I was part of a research team in the field of materials for selective separations via adsorption at the University of Michigan. During the course of our research, we generated several inventions, some of which are described in the subject application, as well as in three parent applications, namely, U.S. S.N. 10/234,681; U.S. S.N. 10/393,962; and 10/613,131. Some of the research, which resulted in the invention(s) described in the subject application, showed that sorbents treated at about 250°C may be partially dehydrated. At this temperature, bulk and loosely surface bound water are removed. Due to the nature of the cationic species, the water molecules that are left behind are generally bound to cations, which binding inhibits or blocks pi-complexation interactions between the transition metals and the aromatic sulfur compounds at those cationic sites (i.e. the cationic sites having water molecules bound thereto). The higher the treatment temperature is, the more water molecules are removed, thus exposing further cationic sites for pi-complexation. We found that appropriate treatment temperatures, wherein the sorbents were sufficiently dehydrated for pi-complexation to take place, ranged from about 250°C to about 600°C. At temperatures at and above 350°C, we found the sorbents to be substantially fully dehydrated, thus allowing for desirable pi-complexation interactions between the transition metals and the aromatic sulfur compounds at most or all available cationic sites. As such, non-limitative examples of some of the more desirable results we obtained were at treatment temperatures above about 350°C.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

  
Arturo J. Hernández-Maldonado

November 16, 2005  
Date